Supporting Postcoordination in an Electronic Problem List

Kevin D. Keck[1], Keith E. Campbell, MD, PhD[2], Christopher G. Chute, MD, DrPH[3],
Peter L. Elkin, MD[3], Mark S. Tuttle[1], William G. Cole, PhD[1]
[1]Lexical Technology, Inc., Alameda, CA; [2]Stanford University, Stanford, CA;
[3]Mayo Clinic/Foundation, Rochester MN

Background. Precoordinated medical terminologies will never be complete and detailed enough to accurately capture clinical descriptions, such as those found in problem lists. Administrative terminologies are inadequately detailed to properly risk adjust patients,[1,2] and the combinatorial explosion in the number of precoordinated terms as detail increases is easily demonstrated. Furthermore, it is impossible for terminology authors to anticipate every term that will ever be needed[3]. Thus, support for *postcoordination*—formal composition of existing terms to express an intended concept—is a prerequisite to accurate encoding of problem list entries.

diag/lab procedure (diagnostic or laboratory procedure). Some sample rules in the grammar are:

```
<problem>: <atomic problem>.
<problem>: <diag/lab procedure> <qual/quant
    modifier>.
<problem>: <problem> due to <etiologic agent>.
```
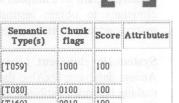**Figure 2 - Sample Grammar Rules**

Thus, since the Semantic Class *diag/lab procedure* includes the Semantic Type *Laboratory Procedure* (T059), the Class *qual/quant modifier* includes *Qualitative Concept* (T169), and the Class *etiologic*

Concepts matching "ESR elevated due to hodgkins"

Concept ID	Status	Preferred Term			Synonym			Semantic Type(s)	Chunk flags	Score	Attributes
		LUI	source/termgp/code	string	LUI	source/termgp/code	string				
C0086250	UMLS	L0014785	MTH/PT/U000008	erythrocyte sedimentation rate	L0014885	MTH/PT/U000077	ESR	[T059]	1000	100	
C0205399	UMLS	L0249055	SNMI96/SY/G-A373	Elevated	L0249055	SNMI96/SY/G-A373	Elevated	[T080]	0100	100	
C0015127	UMLS	L0007463	MTH/MM/U000754	causality <2>	L0565455	SNMI96/PT/G-C001	Due to	[T169]	0010	100	
C0019829	UMLS	L0019829	SNMI96/PT/M-96503	Hodgkin's disease, NOS	L0296837	MSH97/EN/D006689	Hodgkin Disease	[T047|T191]	0001	100	
C0334626	UMLS	L0018195	SNMI96/PT/M-96613	Hodgkin's granuloma	L0305405	MSH97/PM/D006689	Granuloma, Hodgkin	[T047|T191]	0001	100	

Figure 1 - Sample Return from Metaphrase.

Problem. Such support is being demonstrated in the Metaphrase™,[4] electronic poster.[5] Metaphrase is a software component—middleware—that helps caregivers navigate from casual input to formal expressions; in particular, it takes informal input strings and retrieves a list of lexically contained concepts from a database built upon the UMLS® Metathesaurus® (see **Figure 1**). Since, in general, no existing precoordinated term will match the input in its entirety, there needs to be a way for the caregiver to quickly and easily select a suitable postcoordination of existing terms.

Solution. Rather than attempting to develop the complex semantic model which would be necessary for accurate and complete semantic normalization, we have developed a *shallow information model* which exploits some of the semantic information already in the Metathesaurus—namely, the Semantic Types. It consists of an aggregation of Semantic Types into *Semantic Classes*, and a grammar over these Semantic Classes.

The Semantic Classes resemble the axes of a multi-axial coding system, such as SNOMED®, but are practically, rather than philosophically, motivated. Examples of Semantic Classes are *atomic problem*, *qual/quant modifier* (qualitative or quantitative modifier), and

agent includes [both] *Disease or Syndrome*, (T047) and *Neoplastic Process* (T191), the query results in **Figure 1** can be [algorithmically] postcoordinated as *C0086250 C0205399 due to C0019829*, and rendered for the user as "ESR, Elevated, due to Hodgkin disease" as a suggested postcoordination.

One or more versions of Metaphrase are scheduled for deployment in Fall, 1997. Initial results will be reported in the poster.

References

[1] Hannan EL, Kilburn H, Jr., Lindsey ML, Lewis R. Clinical versus administrative data bases for CABG surgery: Does it matter? Med Care 1992;30(10):892-907.
[2] Iezzoni LI. Using administrative diagnostic data to assess the quality of hospital care: Pitfalls and potential of ICD-9-CM. Intl J Tech Assess Health Care 1990;6:272-281.
[3] Roger Côté, MD, FCAP, Editor of SNOMED International, relates the anecdotal example of a sudden outbreak of "Cinnamon oil glossitis" traced to a bad batch of chewing gum.
[4] Partially supported by the NLM+AHCPR EMR Collaborative Grant U01 HS/LM-08751.
[5] Cole WG, Tuttle MS, Keck KD, Olson NE, Chute CG, Safran C. Proc AMIA Annu Fall Symp 1997 (In press).